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THE CETACEA.

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THE Cetacea, as the inhabitants of the water areas of the earth's surface, have had ample space for variation and multiplication of forms, an opportunity of which only a moderate advantage has been taken. The conditions have been more uniform than those to which land mammals have been subject, and a corresponding uniformity prevails in this order. Owing to their habitat, opportunities for their preservation have been better than in the case of animals of the land, and accordingly great deposits of their bones exist, notably on the east coast of the United States, and in certain deposits of Belgium and Italy. Among the species brought to light in these localities, as among those now existing, we find examples of the most gigantic, not only of the Mammalia, but of the Vertebrata. The exising *Balænoptera borealis* reaches a length of over one hundred feet; and several other species, including the sperm whale, attain to eighty feet.

The order of Cetacea is one of those of whose origin we have no definite knowledge. It appears sparingly in the Zeuglodontidæ in the Eocene period, and has its greatest multiplication in the ages of the Miocene. The Zeuglodontidæ are the most generalized family, and forms intermediate between them and the modern Cetacea are found in Miocene beds. Modern types are, however, contemporaries of the latter, and these have achieved a multiplication of forms in Pliocene and modern times.

The line of successional modification of the Cetacea is found in changes in (1) the shape of the skull; (2) the extinction of the dentition; (3) the shortening of the cervical vertebræ; and (4) in the separation of the ribs from articulation with the vertebral centra. The modification of the shape of the skull is related to the gradual transfer of the external nostrils to more and more posterior positions, until they remain, in the extreme types, above, or even behind above, the eyes. In this process the nasal, frontal and parietal bones become excessively abbreviated, so that in the modern toothed whales, they form a narrow band between the nostrils and the superior border of the occipital bone.

The order is naturally divided into three sub-orders, which are defined as follows:

External nostrils on the superior side of the muzzle; teeth present; ribs with two heads; *Archæoceti.*

External nostrils above gullet; teeth generally present; no whalebone; some of the ribs with two heads; *Odontoceti.*

External nostrils above gullet; teeth wanting; the gums supporting "whalebone"; ribs articulating by tubercle only; *Mysticeti.*

All of the above characters are those of divergence from the principal mammalian stem, and have relation to the conditions of aquatic life. Thus the posterior position of the nostrils permits inspiration without the elevation of the muzzle above the water-level, which is rendered difficult, if not impossible in the most specialized types, by reason of the extreme flatness and inflexibility of the cervical vertebræ. The absence of teeth is appropriate to the habits of the types which lack them. Thus the Physeteridæ among Odontoceti feed principally on squids, whose soft bodies are swallowed whole. The Mysticeti feed on minute Crustacea and Mollusca, which they retain in the mouth by straining the water through their bristly whalebone, or baleen. The disarticulation and disappearance of the heads of the ribs in the Mysticeti, is appropriate to the support which all the viscera derive from the fluid medium in which these large animals live. Strong articulation of the head of the ribs to the vertebral column is no longer necessary.

Paleontology confirms the inference derivable from their anatomy, that the phylogeny of the Cetacea has followed the order, Archæoceti, Odontoceti, Mysticeti.

The mechanical causes which may have given origin to the modifications which measure this succession, may be suggested as follows: The shortening and obliteration of the neck is probably due to disuse, since the general mobility of the body in a watery medium renders much flexibility of the neck unnecessary, the entire body being readily turned about. It may have resulted, also, from the increase in the relative proportions of the head, which renders it extremely difficult to handle; a function which is, in the modern Cetacea, quite aborted. The early and rapid reduction, and in some lines, extinction of the dentition, is a result of disuse consequent on the increasing percentage of soft or minute food used by the more modern types. So the loss of the rib-heads in the Mysticeti may be traced to disuse, since, as above remarked, they lack the strain caused by the weight of the thoracic and abdominal walls and the contained viscera, which they experience in animals which are not supported by some external medium. The same reduction took place in the ocean-dwelling Plesiosauria,[1] and in those terrestrial reptiles in which the weight of the body is borne on the earth, as the lizards proper, and snakes. As regards the gradual transfer posteriorly of the external nostrils, the following mechanical hypothesis has been suggested. They have been used as a discharge pipe for air and water from the lungs and mouth, and, of course, facility of exit is directly as the shortness of the conduit. It is possible that the constantly recurrent presence of a column of air and water on the posterior inferior wall of the nareal canal has literally pressed back this obstructive roof, until it has ceased to resist the outflow by becoming vertical.

I. ARCHÆOCETI.

This suborder embraces but one known family, which is defined as follows:

Frontal bones with flat, expanded supraorbital region; teeth two-rooted posteriorly, one-rooted anteriorly; *Zeuglodontidæ.*

[1] It must be remarked here that the equally marine Ichthyopterygia have two-headed ribs, but they are of equal length, close together, and mechanically equivalent to one.

The species of this family belong to the genus Zeuglodon[2] Owen, although when the *Z. brachyspondylus* Müll. is better known it may be found to be referable to a distinct genus, Doryodon Gibbes. The longer known *Z. cetoides* Ow. is distinguished by many peculiarities. Its skull presents a long symphysis of both premaxillary and mandibular bones. The cervical and dorsal vertebræ are of similar and medium length, while those of the lumbar region are remarkably elongate. The fore-limb was short, and in its cubital region quite narrow (teste Müller). The enamel of the teeth is wrinkled, and the posterior two-rooted teeth have coarsely serrate cutting edges fore and aft. The animal could not have been less than seventy feet in length. Bones of species of Zeuglodon have been found in the Upper Eocene of Arkansas and the Gulf States (in the White Limestone of Alabama), and of Engländ and Egypt. It is also recorded as occurring in the Miocene of Malta.

II. ODONTOCETI.

This group is the most numerously represented by species, recent and extinct. The families differ as follows:

I. Teeth of two types, one and two-rooted.

Neck longer; teeth in both jaws; *Squalodontidæ.*

II. Teeth uniformly one-rooted,

a, Ribs nearly all two-headed.

Teeth in both jaws; neck generally longer; *Platanistidæ.*

Teeth in lower jaw only; neck short; *Physeteridæ.*

aa, Four or five anterior ribs only two-headed.

Teeth in both jaws; neck short; *Delphinidæ.*

The SQUALODONTIDÆ resemble the Zeuglodons in the form and character of their teeth, but the form of the skull is very different. They nevertheless, by their intermediate position, indicate the ancestral relation of the Zeuglodontidæ to the other Cetacea. But little is known of the skeleton of the Squalodontidæ. The species occur in Miocene beds of North America and Europe. They did not attain such huge proportions as the Zeuglodons, and did not exceed thirty feet at the most. The genera known are two, as follows:

[2] *Basilosaurus* Harl.

The posterior molars two-rooted; *Squalodon* Gratel.
Some of the posterior superior molars three-rooted; *Trirhizodon* Cope.

Squalodon grateloupii Pedroni and *S. antverpiensis* Van Ben. are the most abundant European species. In America the *S. atlanticus* Leidy has been found in New Jersey and Maryland, and the *S. holmesii* Leidy, a species with more delicate teeth than the last, has been discovered in South Carolina.

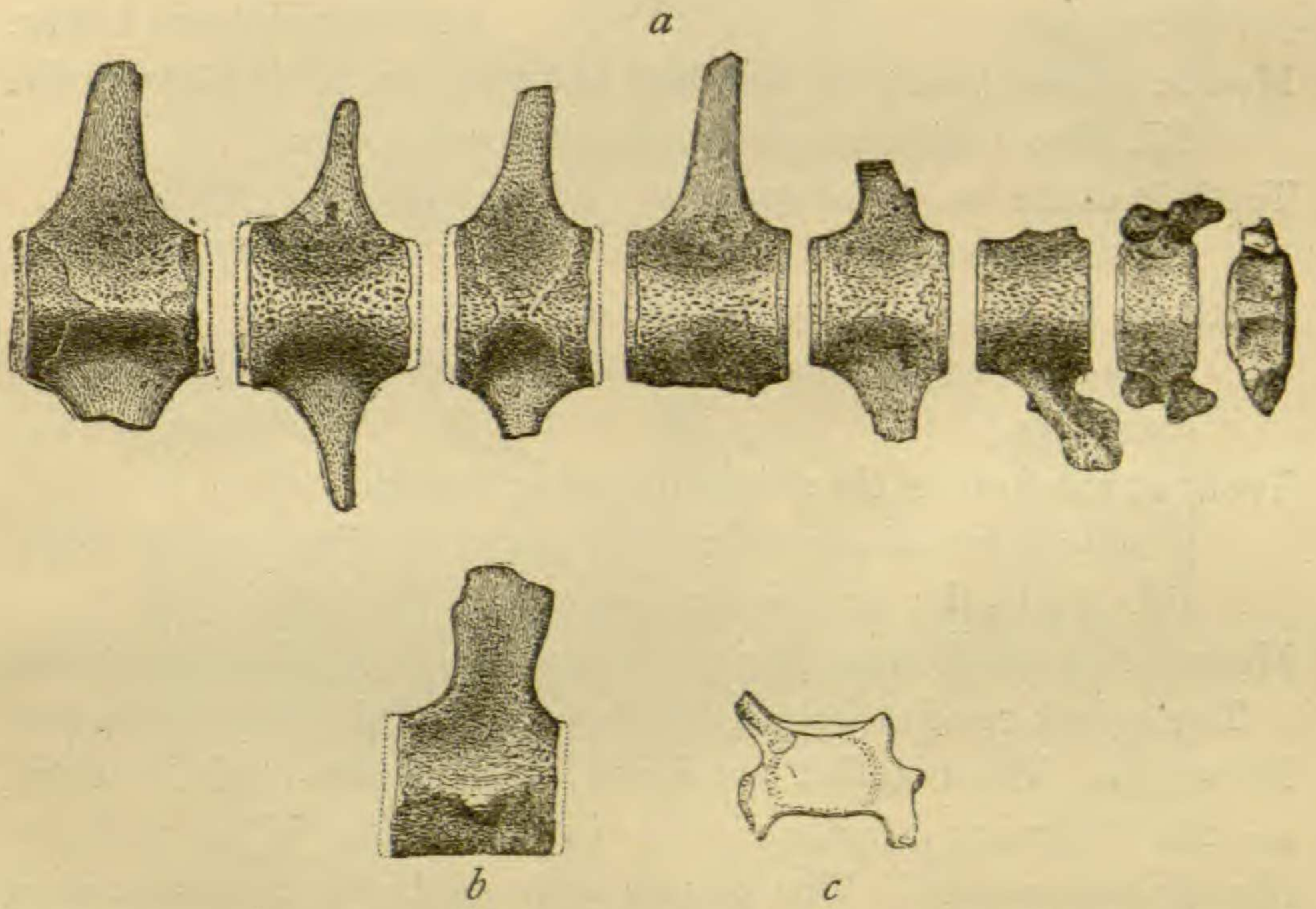


FIG. 1.—*Ixacanthus spinosus* Cope dorsal and lumbar vertebræ, two-sevenths natural size; *a*, from below; *b*, lumbar from side; *c*, cervical from front. Type; original; from Miocene of Maryland.

The greater number of the PLATANISTIDÆ are extinct. The genera differ much among themselves in the number and form of the teeth, and the relative form of the neck. Some of the species reach the size of the smaller whales, as the *Cetophis heteroclitus* Cope; but most of the species have the average dimensions of the dolphins. The genera differ as follows:

I. Teeth with roots extended transversely.

Teeth with lateral basal lobes; lumbar diapophyses wide; *Inia* Geoffr.

II. Teeth with cylindric roots.

a, Caudal vertebræ plano-convex.

No caudal diapophyses; *Cetophis* Cope.

aa, Caudal vertebræ plane.

β, Lumbar diapophyses spiniform.

Lumbar and caudal vertebræ slender; *Zarhachis* Cope.

Lumbar and caudal vertebræ short; *Ixacanthus* Cope.

ββ, Lumbar diapophyses wide, flat.

Muzzle elongate, slender; cervical vertebræ long; *Priscodelphinus* Leidy.

Muzzle slender; cervical vertebræ shorter; *Pontoporia* Gr.

III. Teeth with longitudinally flattened roots.

Teeth in entire length of maxillary bone; symphysis connate; *Stenodelphis* Gerv.

Teeth on all the jaws; symphysis not connate; an erect osseous crest on posterior part of maxillary; *Platanista* Cuv.

Teeth at the base of the maxillary only; muzzle produced into a sub-cylindrical beak; *Rhabdosteus* Cope.

IV. No teeth; an alveolar groove.

Muzzle depressed, elongate; *Agabelus* Cope.

The recent species belong to the genera Inia, Pontoporia and Platanista. The two first are found in the rivers of S. America, and the *Platanista gangetica* in the rivers of India. Their posterior ribs are one-headed. The genera with spiniform diapophyses of the posterior vertebræ are only known so far from N. America. The *Ixacanthus cœlospondylus* Cope was a short robust species about the size of a white whale. Another line of modification is seen in the attenuation of the vertebral column. The most remarkable elongation of the vertebræ is found in Zarhachis, a character which is only paralleled in Zeuglodon. Of the other genera, Stenodelphis, with its single species *S. canaliculatus* (Delphinus, von Meyer), has been so far found in the middle Miocene of Central Europe. Priscodelphinus occurs in the Miocene of North America and Europe. The *P. grandaevus* Leidy (Figs. 2 and 3), of the Miocene of New Jersey has a slender muzzle, with a full series of curved cylindric teeth; a neck like that of a seal

in proportions, and a long slender body. The first sternal segment is T-shaped, and the ribs are slender, compressed, and mostly two-headed. The paddles are unknown. Other species of the genus are found in the Miocene beds of Maryland. The species of the remaining five genera have been found thus far only in the Miocene of North America. Nineteen species of Platanistidæ have been described from the latter region.

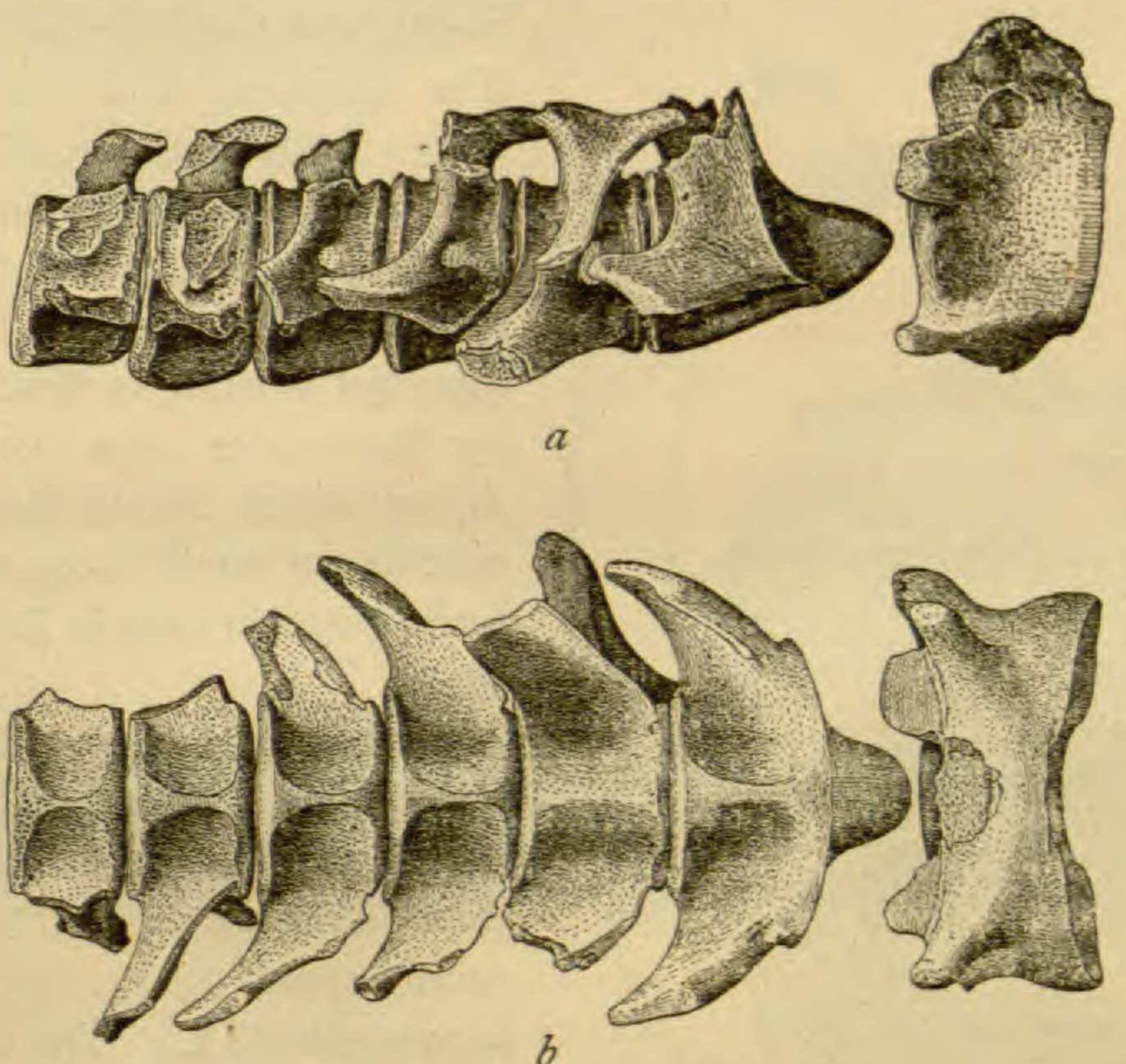


FIG. 2.—*Priscodelphinus grandaevus* Leidy, cervical vertebræ; *a*, from side; *b*, from below. Original; from Miocene of Cumberland County, N. J. One-third natural size.

One line of modification observable in the extinct genera is towards the extreme which is seen in Rhabdosteus Cope. Here the muzzle reaches an extraordinary elongation, and for the greater part of its length forms an edentulous cylinder, which resembles the beak of the sword-fishes. The few teeth which remain at the base of the muzzle are like those of Platanista, with roots compressed so as to be longitudinal, and crowns compressed so as to be transverse, to the axis of the skull. The *R. latiradix* Cope (Fig. 4.), is not uncommon in the Miocene beds of Maryland. Its

skeleton is unknown. The nearest approach to Rhabdosteus is made by the genus Stenodelphis. In Cetophis, the caudal centra have one face very convex, offering greater flexibility than is possible in any other genus. The *C. heteroclitus* is from the Maryland Miocene. A genus Lophocetus has been established for the *Delphinus calvertensis* of Harlan, also from the Maryland Miocene. Its position is uncertain; the skull resembles that of Inia, but the roots of the teeth are cylindric. The temporal and occipital ridges are very strong. Skeleton unknown. Delphinodon Leidy is represented by teeth only, from N. American localities, but a skull is described by Burmeister from Buenos Ayres, which shows that the nostrils are much more anterior in position than in Lophocetus.

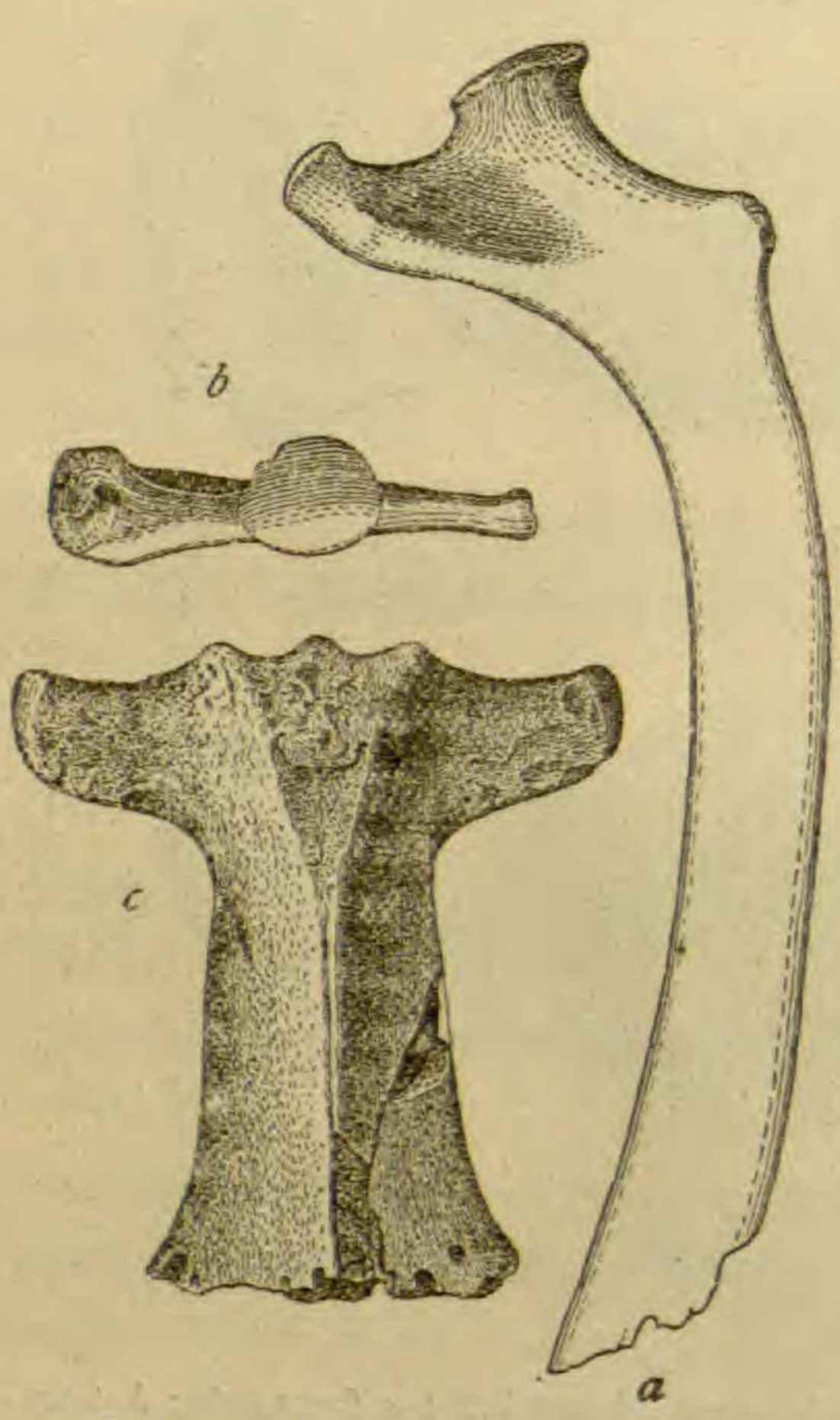


FIG. 3.—*Priscodelphinus grandaevus* Leidy; one-half natural size; Miocene of Cumberland County, N. J. *a*, rib from side; *b*, do. proximal extremity; *c*, mambrium sterni. Individual represented in Fig. 2.

Extinct and recent forms about equally divide the PHYSETERIDÆ, but the largest dimensions are reached by the recent sperm whale, *Physeter macrocephalus* L. The modifications of the family type are chiefly those of the dentition, but the skull develops crests of a peculiar character in a number of the genera. These are distinguished as follows:

I. Lower jaw with numerous teeth.

a, Teeth with crown and root continuous, and without enamel. Inion and temporal ridges forming a crest which encloses a basin-shaped cavity of the front. Zygoma complete; symphysis mandibuli long; *Physeter*[3] Linn.

[3] *Eucetus* DuBus.; *Physetodon* McCoy; *Stenodon* VanBen=*Orycterocetus* Leidy.

PLATE XX.

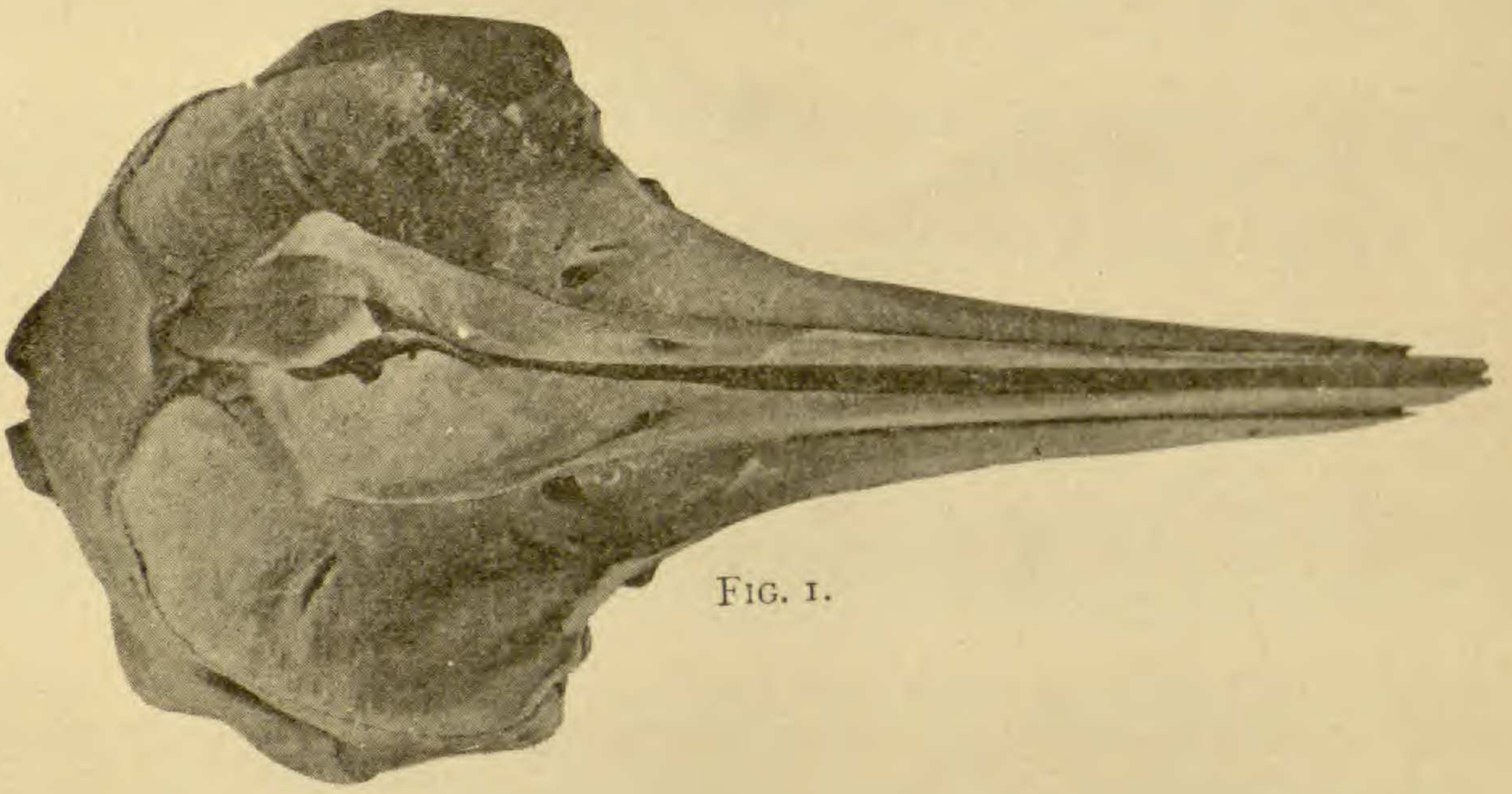


FIG. 1.

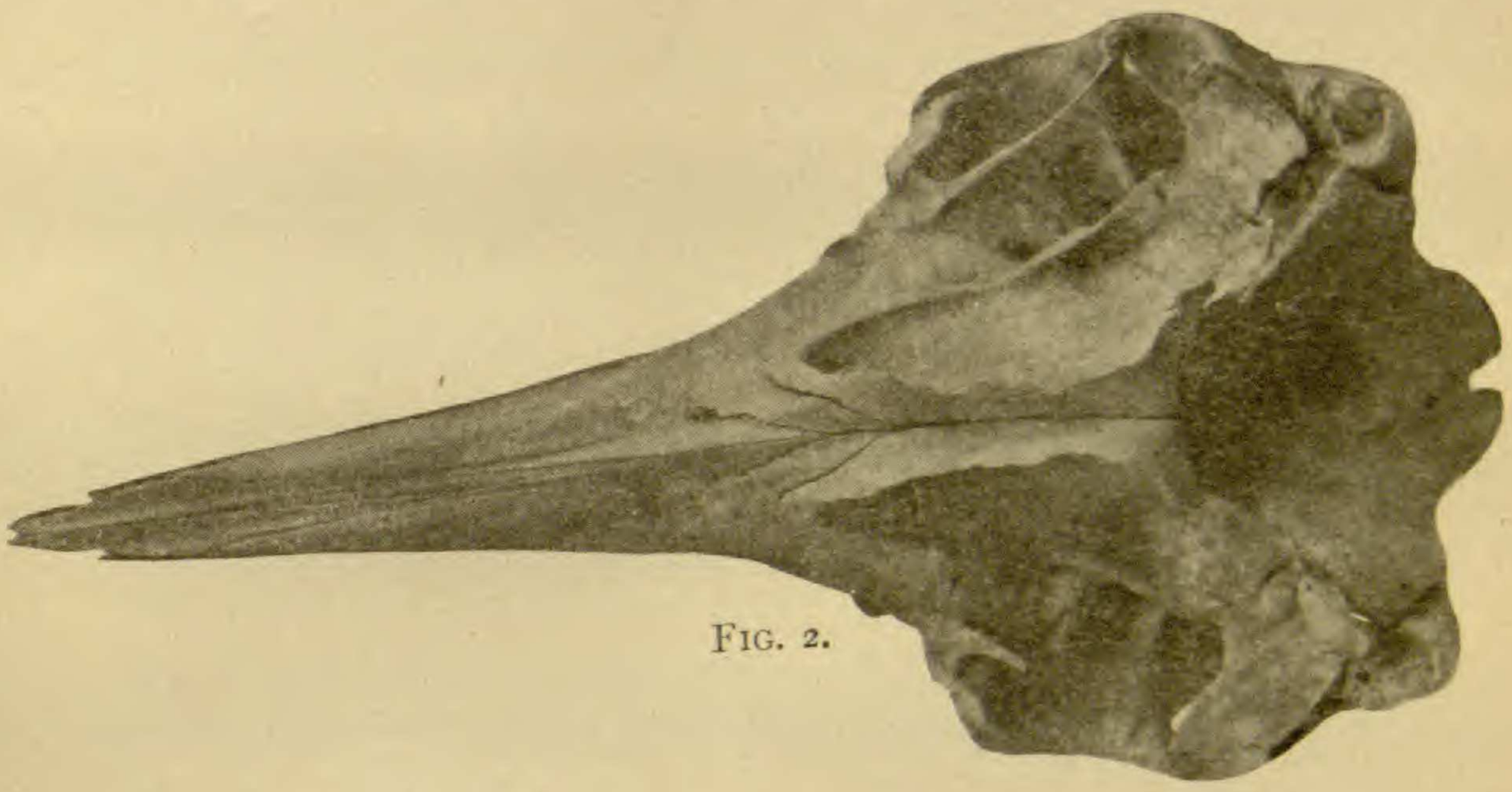


FIG. 2.

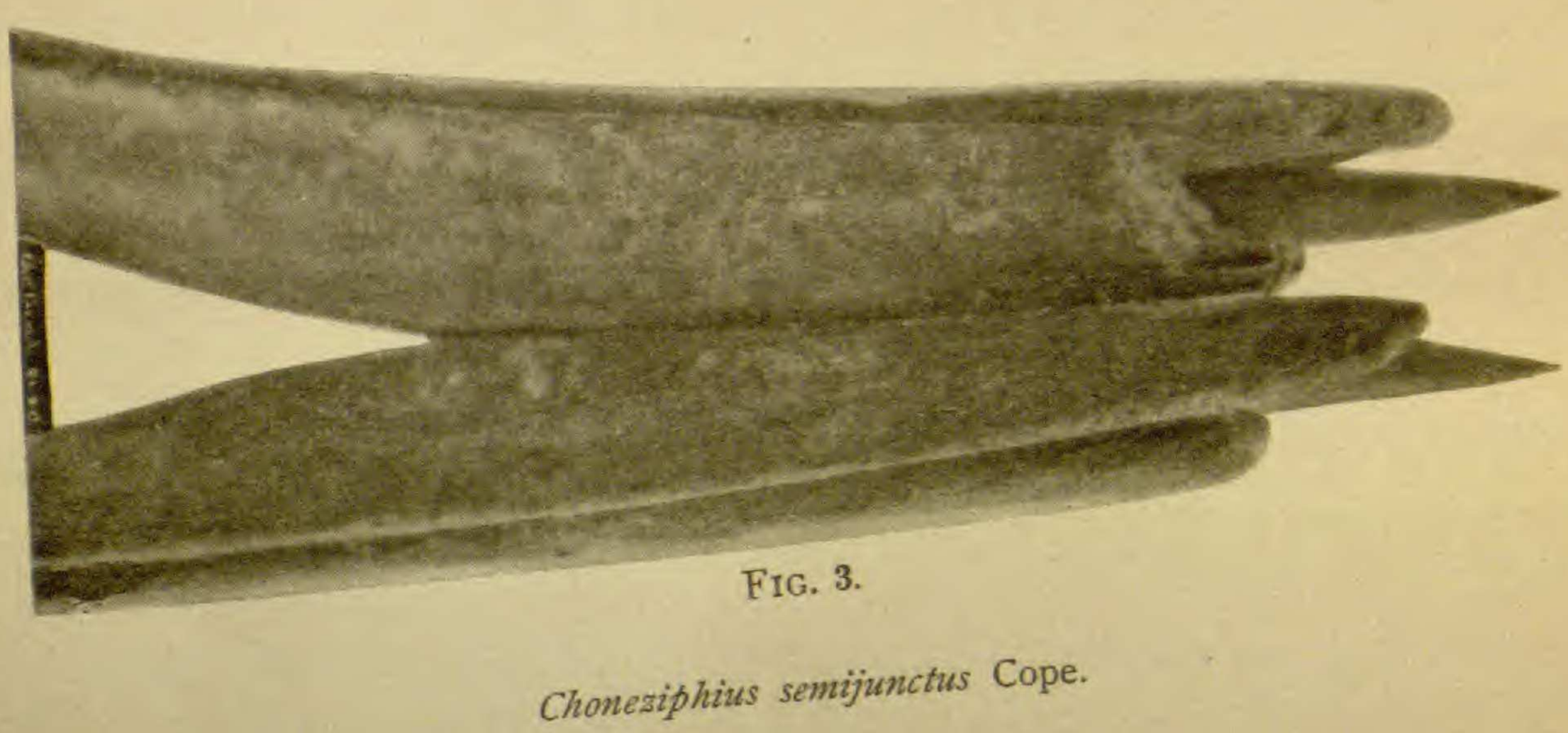
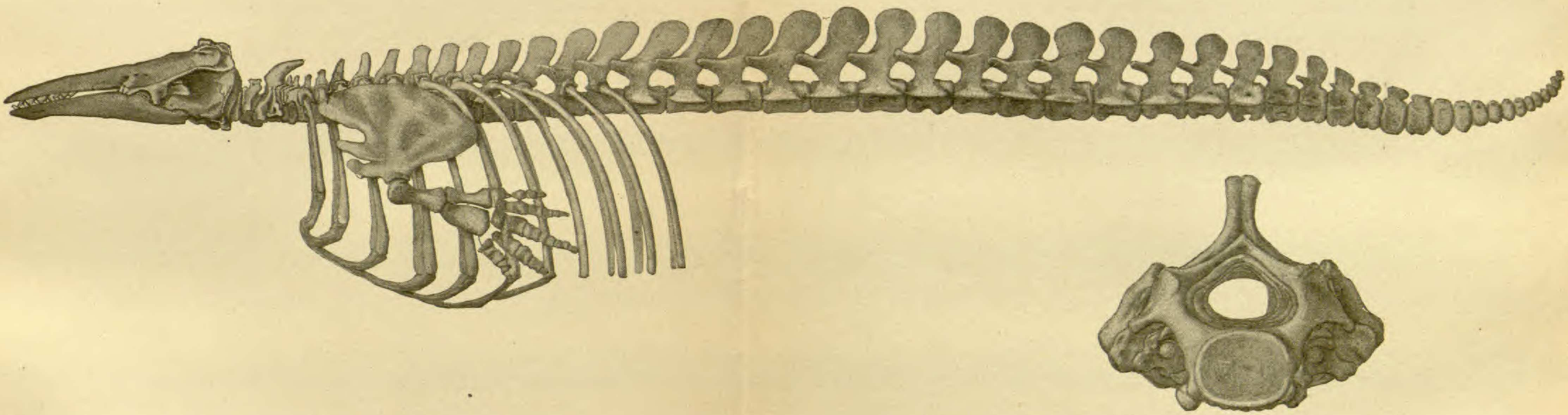


FIG. 3.

Choneziphius semijunctus Cope.

PLATE XXI.



Delphinapterus leucas Pallas.

Zygoma interrupted; symphysis short; *Kogia*[4] Gray.

aa, Teeth fusiform, with enameled crown.

Cement coating thick; *Physodon*[5] Gerv.

aaa, Crown and root of teeth distinct; crown with enamel.

Cement very thick; *Hoplocetus* Gerv.

II. Low jaw with very few teeth.

a, Maxillary bones with vertical longitudinal crest behind.

A tooth at the extremity of each ramus mandibuli; *Anarnacus*[6] Lacep.

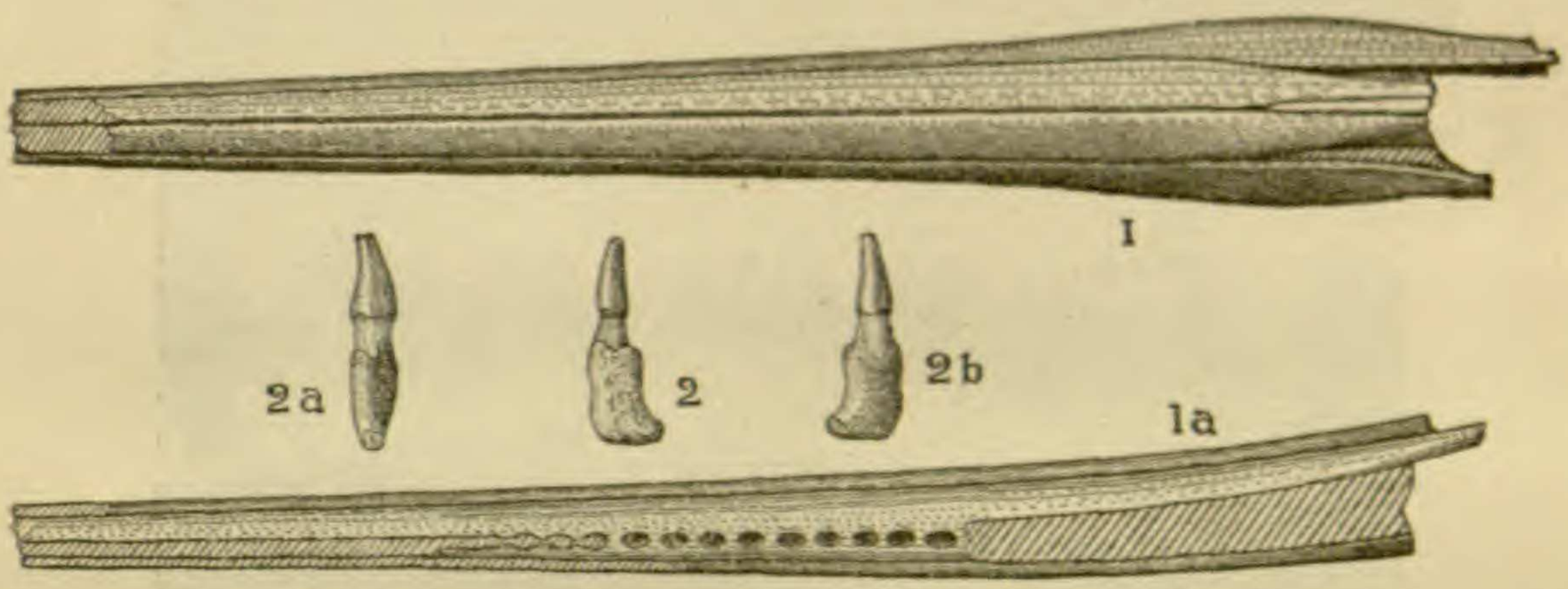


FIG. 4.—*Rhabdosteus latiradix* Cope (type); two-ninths natural size; original; from Miocene of Maryland. 1, muzzle from above; 1*a*, do. left side; 2, 2*b*, tooth from side; 2*a*. do. from edge. The posterior parts of the maxillary and premaxillary bones are restored from a different specimen from that represented in the rest of the figures. Teeth also separate; two-thirds natural size.

aa, Maxillary without vertical posterior crests.

Two teeth at the extremity of each mandibular ramus; *Berardius* Less.

Mandibular ramus with a terminal tooth; *Choneziphius* Duv.

Mandibular ramus with a median tooth; *Mesoplodon* Gerv.

As already remarked, the extinct sperm whales do not equal in dimensions the single recent species. Their teeth differ a good deal from those of the latter. Thus the American form, which Leidy called Orycterocetus, have the crowns quite slender, and the pulp-cavity large. They occur in the Miocene beds from

[4] *Physeterula* Van Ben.

[5] *Scaldicetus* DuBus [?]; *Balænodon* Owen.

[6] *Hyperoödon* Lacep.

Maryland to North Carolina. The species from the Miocenes of Belgium and Australia have the pulp-cavity very small. The Kogias or pigmy sperm whales are found in all southern and tropical seas. A single extinct species, the *K. dubusii* Van Ben. has been found in the Miocene beds of Belgium. *Hoplocetus carolinensis* Leidy is from the phosphatic deposits of South Carolina. But one extinct species of Anarnacus (Hyperoödon) (Fig. 5), has

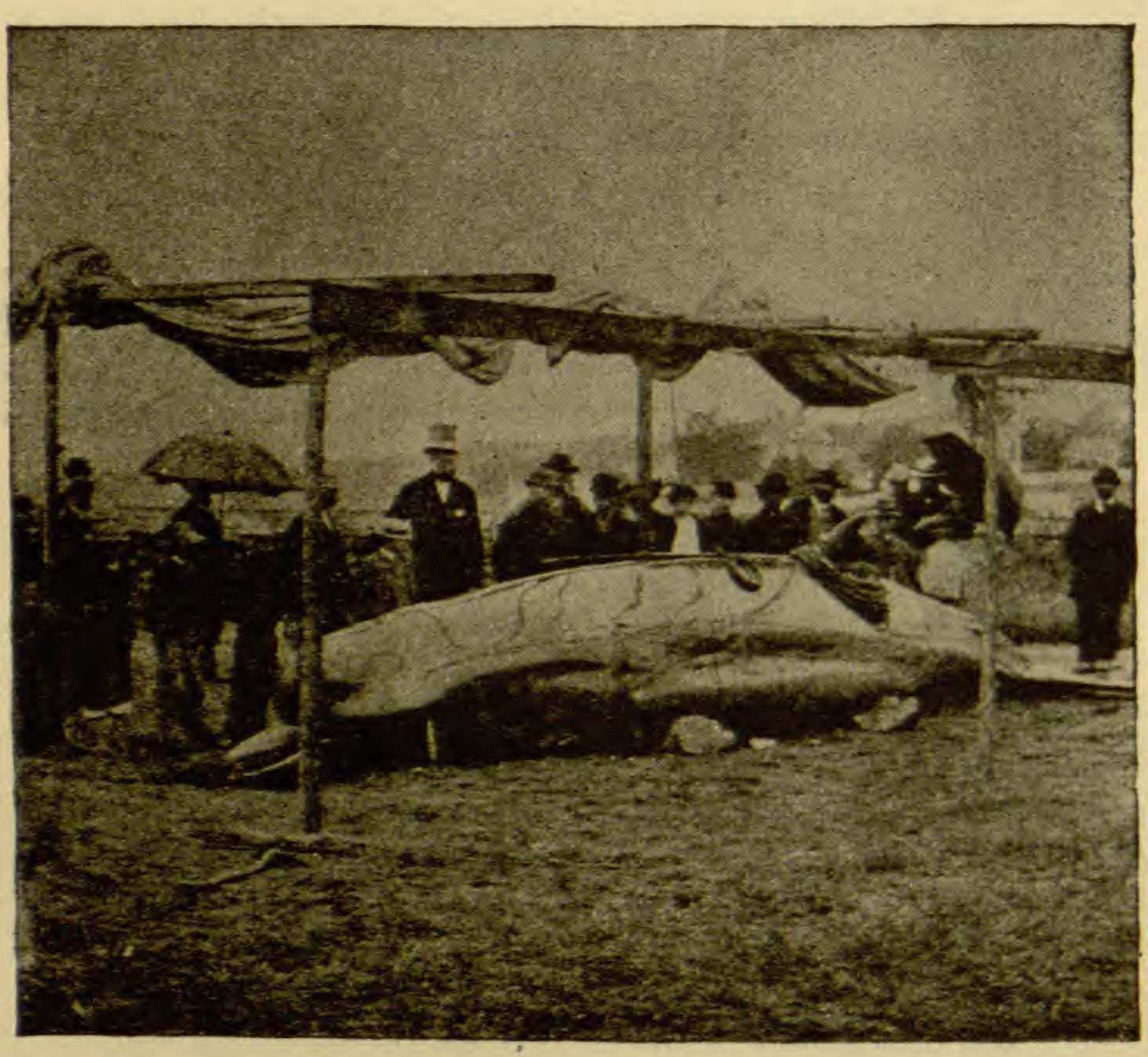


FIG. 5.—*Anarnacus rostratus* Wesm, from a photograph taken at Newport, R. I.

been yet found (in Belgium), but species of Choneziphius are abundant in the Miocene beds of both Europe and North America, Five species have been described by Leidy from the South Carolina phosphatic beds, of which the most conspicuous is the *C. trachops*. Mesoplodon is represented in the same formations by one species, the *M. prorops* Leidy. A species of each genus still lives on the coast of the United States, the *Choneziphius semijunctus* Cope (Plate XX.), and the *Mesoplodon bidens* Sowerby.

The DELPHINIDÆ are preëminently a modern type (Fig. 6). They display a tendency to the reduction of the rib heads, which is completed in the whale-bone whales, and the nostrils are far posterior, and the nasal bones mere tuberosities. The dentition differs within moderate limits; the killers, as the carnivora of the sea, having it powerfully developed, while in the grampus and Globiocephalus many of the teeth are shed. Monodon develops a large incisor with which it breaks the ice in Arctic regions. The genera differ as follows:

I. Cervical vertebræ mostly distinct.

a, Incisors not differentiated.

Teeth few, caducous; *Delphinapterus*[7] Lac.

aa, Superior incisors of one side forming a straight tusk.

Teeth few, deciduous; *Monodon* Linn.

II. Cervical vertebræ mostly coössified.

A. Flippers short, with less than twelve phalanges in the second finger.

a, A dorsal fin.

Teeth few, very robust; palate not grooved; *Orca* Gray.

Teeth medium, numerous, acute; palate not grooved; *Lagenorhynchus*[8] Gray.

Teeth medium, numerous, acute; palate grooved; *Delphinus* Linn.

Teeth numerous; premaxillae elevated in front of nares; palate plane; *Sagmatias*[9] Cope.

Teeth few, easily shed; *Grampus* Cuv.

Teeth compressed, spatuliform; *Phocæna* Cuv.

aa, No dorsal fin.

Teeth numerous, not caducous; *Leucorhamphus*[10] Lillj.

Teeth flat, spatuliform; *Neomeris* Gray.

AA. Flippers long, falciform; index with twelve or more phalanges.

A dorsal fin; teeth few, caducous; *Globiocephalus* Gray.

[7] Beluga Gray.

[8] Tursiops and Prodelphinus Gerv.

[9] Dorsal fin unknown.

[10] Delphinapterus Less. nec Lacep.

But few species of this family are known from terranes of earlier than Pliocene age, and they belong to existing genera. Extinct species of Delphinapterus and Orca have been found in the Italian Pliocene, and of Orca and Globiocephalus in England. In North America the *Delphinapterus orcinus* has been described from the Miocene of North Carolina, and the *D. vermont-*

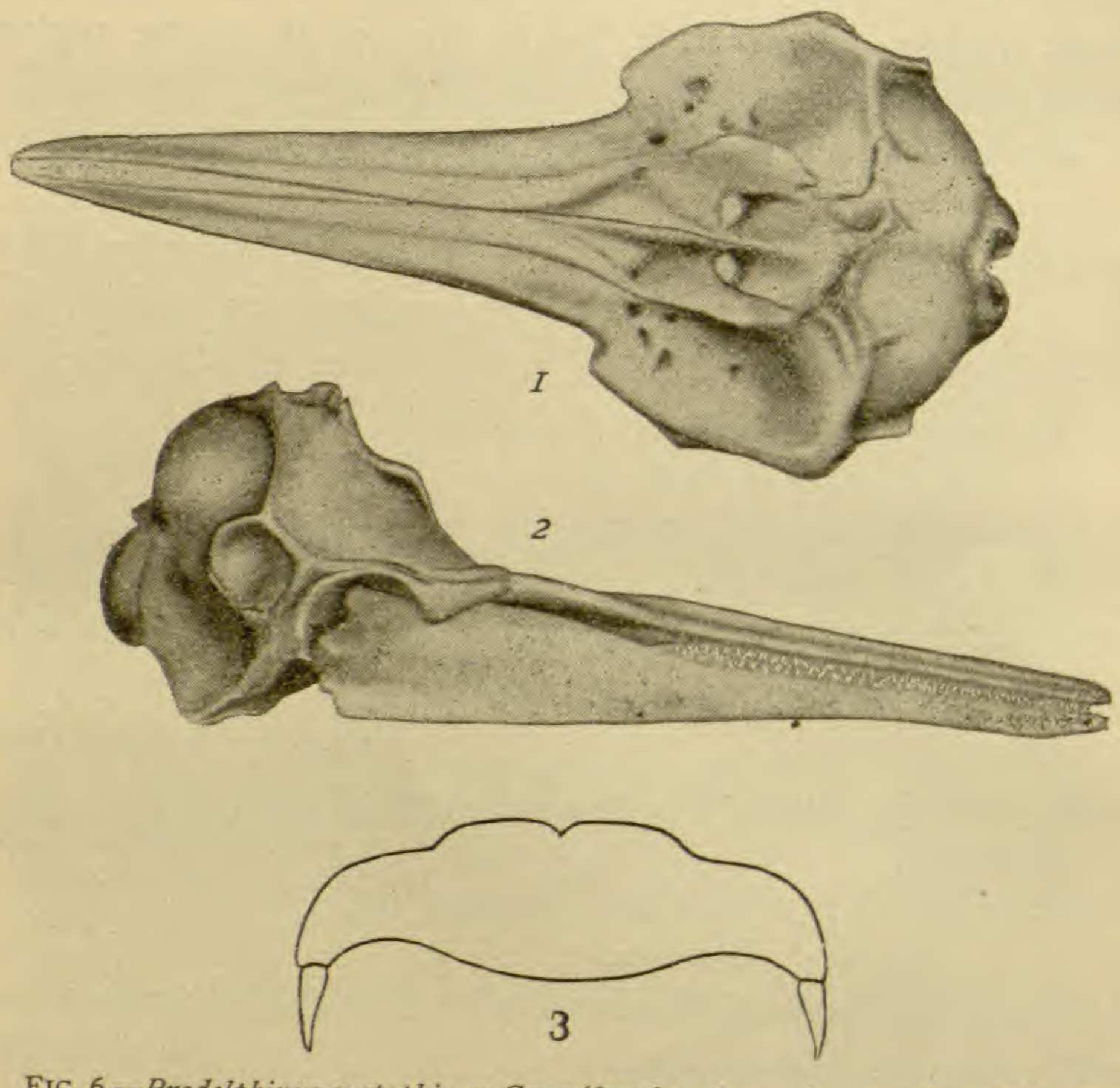


FIG. 6.—*Prodelphinus crotaphiscus* Cope (from type); 1, above, 2, from side; 3, section of muzzle. About one-fifth natural size.

anus has left its remains in the so-called Champlain clays of the drainage basin of the St. Lawrence river, which are perhaps of Plistocene age (Plate XXI.).

MYSTICETE.

This suborder embraces but a single family, the Balænidæ, whose characters may be summarized as follows:

Nareal canal oblique, overroofed by the short horizontal nasal bones, and underroofed by the elongate ptery-

goids; no longtitudinal or transverse crests of the skull; *Balænidæ.*

The family of the whalebone whales is represented by many species both recent and extinct. These fall into a number of natural genera, which display several affinities towards different extremes. Thus the fin-backs (Balænoptera) have developed speed through increased length of body; the humpbacks (Megaptera, have developed especial length of the fore limbs, while the right whales (Balæna) have acquired a huge oral cavity and the greatest length of whalebone. The fin-backs pursue and devour great numbers of fishes of small and medium dimensions, and their maw derives an especial capacity for containing them, through the presence of numerous expansible longitudinal folds of its inferior walls. The Balænæ, on the other hand, take in enormous quantities of water, which contains their minute molluscous food, and so enjoy an especial advantage in this direction,

BALÆNIDÆ are abundant in the Miocene, having an origin prior to that of the Dephinidæ. They would seem to have derived their descent from some form allied to the Squalodontidæ, since their nasal bones are more elongated than those of the Odontoceti, and in Plesiocetus the superior cranial bones show some of the elongation of that family. The genera of Balænidæ differ as follows:

I. Frontal and parietal bones elongated on the median line.
Cervical vertebræ distinct; *Plesiocetus* Van Ben.

II. Frontal and parietal bones much abbreviated in the median line.

A, Cervical vertebræ all distinct; fingers four.

a, Numerous gular folds; vertebral canal not enclosed; [11]
No coracoid; manus long; *Megaptera* Gray.[12]
A coracoid; manus not elongate; *Cetotherium* Brandt.[13]
Mandible with a long angle; coronoid large; *Herpetocetus* Van B.

[11] The external characters of Cetotherium and Herpetocetus are unknown.

[12] Poescopia Gray, Burtinopsis Van Ben.

[13] Eschrichtius Gray. Cetotheriophanes Brandt.

aa, Numerous gular folds; vertebral canal enclosed by diapophyses and parapophyses;

Both coracoid and acromion; manus short; a coronoid process; a dorsal fin; *Balænoptera*.[14]

aaa, Only two gular folds;

No dorsal fin; an acromion; *Rhachianectes* Cope.

aaaa, External characters unknown; maxillary bones very narrow.

Manus short; *Mesoteras* Cope.

AA. Cervical vertebræ more or less coössified.

Anterior three cervicals only united; *Palæocetus*, Seeley.[15]

All cervicals coössified; fingers five; no gular plicæ; no coronoid process; *Balæna*, Linn.[16]

The genus Plesiocetus is intermediate in its characters, and as it is generalized in structure, it is probably the ancestral type from which modern Balænidæ have been, by a process of differentiation, derived. Four species have been described from Belgium. The largest of these, *P. brialmontii* Van Ben., was some sixty feet in length; while the *P. brevifrons* Van B. and *P. affine* Van B. were twenty feet and less in length. Cetotherium is more nearly allied to Balænoptera (the finners). The number of species appears to have been considerable, several having been described from Southeastern Europe, one from Italy (*C. capellinii*), and others from Belgium and England. Corresponding species have been found in the Miocene beds of the Eastern States of North America. The *C. cephalus* Cope is about thirty feet in in length, the head being nine feet; and its flippers short. The ear bulla is noticeably compressed, somewhat incurved, and with a nearly parallelogrammic outline from the side; (Fig. 7). The skeleton was found in Charles Co., Maryland. (Plate XXII.) There have been described several species, probably of this genus, from the same region and horizon, of smaller size, the least, *C. pusillum* Cope, having been about fifteen feet in length.

[14] Physalus Gray.

[15] Eubalæna, Macleayius, and Halibalæna Gray; Balænula and Balænotus Van Ben.

[16] The difference between Neobalæna Gray and this genus is not yet known.

Species of Balænoptera and Megaptera occur in the European and probably in the American Miocenes. Those of Belgium correspond in various respects with the existing species. Thus *Balænoptera goropii* is compared by Van Beneden with the common existing finner, *B. musculus;* the *B. borealina* Van B. with the *B. borealis* of the Atlantic; and the *B. emarginata* Owen with the small pike whale, *B. rostrata.* Three species of Belgium and England are referred to the hump-backs, or Megaptera. A remarkable genus is Herpetocetus Van B., of which a single species of rather small size has been found in Belgium.

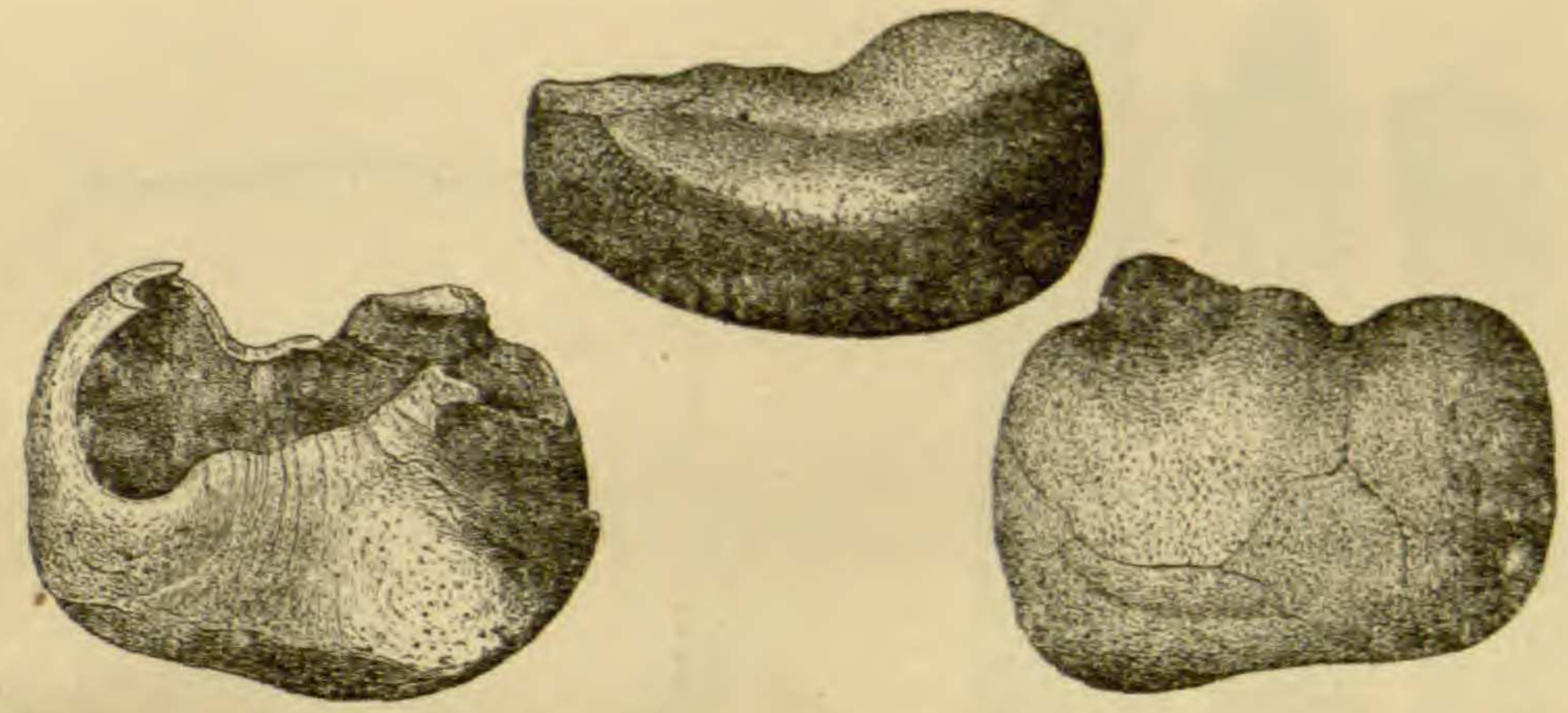


FIG. 7.—*Cetotherium cephalus* Cope, otic bulla. One-half natural size; original; from Miocene of Maryland.

Forms more or less nearly related to the right whales occur in Miocene beds on both sides of the Atlantic. Mesoteras Cope has the characters of the finner whales (Balænoptera) with the narrow maxillary bones of the true Balænæ. A large species with a skull of about eighteen feet in length was found by Prof. W. C. Kerr in Eastern North Carolina, and was named by the writer *Mesoteras kerrianus.* It is distinguished by an enormous thickening of the superciliary part of the frontal bone. The periotic bones are peculiar for their very short proportions, and balæni-form bulla. A small balænoid with only partly ossified cervical vertebræ has been found in the boulder clay of England and named *Palæocetus sedgwickii* by Prof. Seeley. The *P. insignis* Van Ben. from Belgium is also a small species. True Balænæ have been found in various parts of Europe.

In Western Europe three species are recorded from the Miocene, and two from later beds. Of the former, *B. affinis* Owen is similar in size and character to the right whale, *B. mysticetus*, and *B. primigenia* Van Ben. to the shorter headed type represented by the *B. cisarctica* of the middle Atlantic (Plate XXIII.). The *B. balænopsis* Van B. is not over twenty feet in length. In the Plistocene beds of Sweden a true Balæna of the *B. cisarctica* type has been discovered, and has been named *B. swedenborgiana.* It is thus evident that many species of whalebone

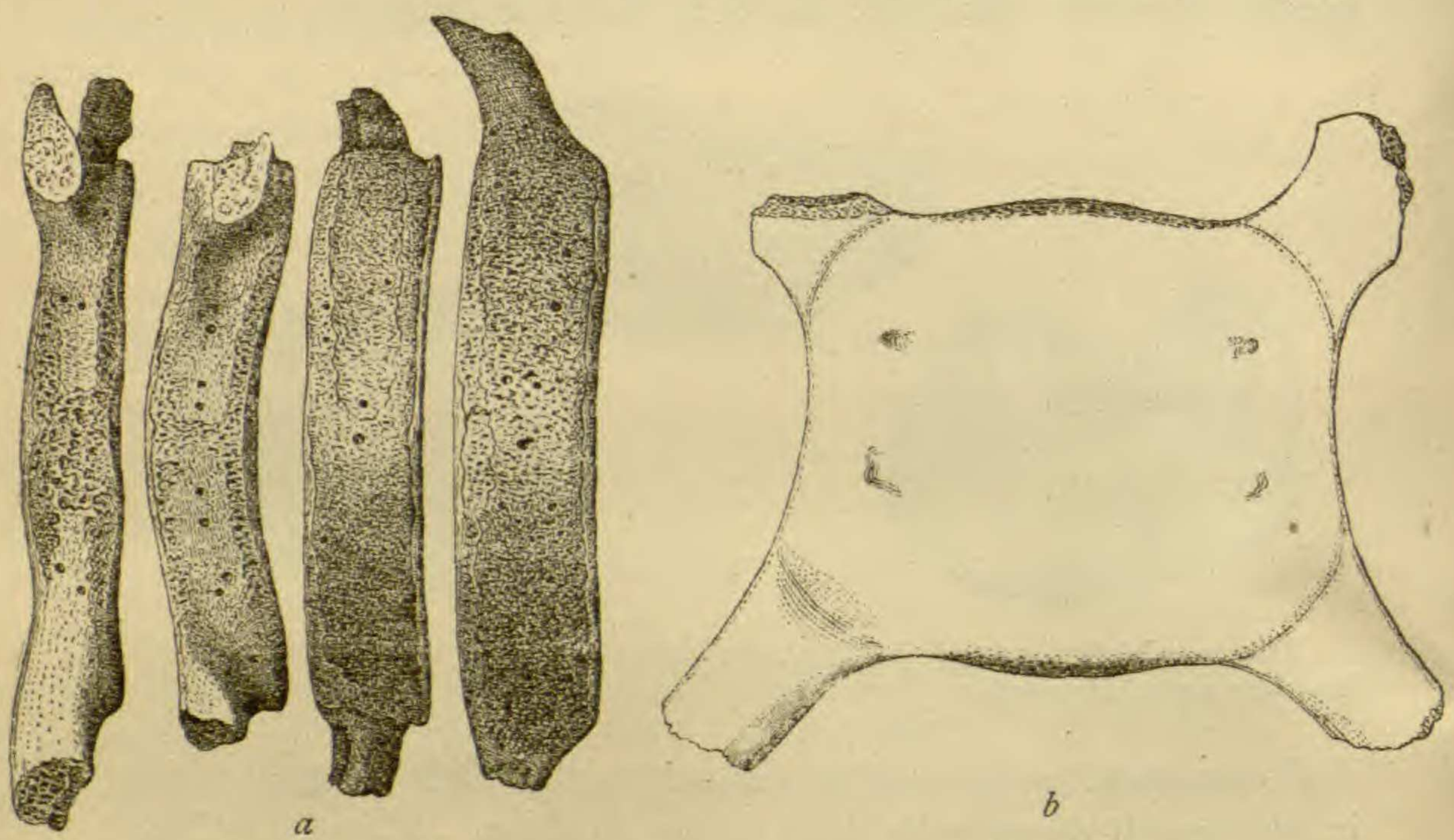


FIG. 8.—*Cetotherium cephalus* Cope, two-fifths natural size; individual represented in Fig. 7. Original; from Miocene of Maryland.

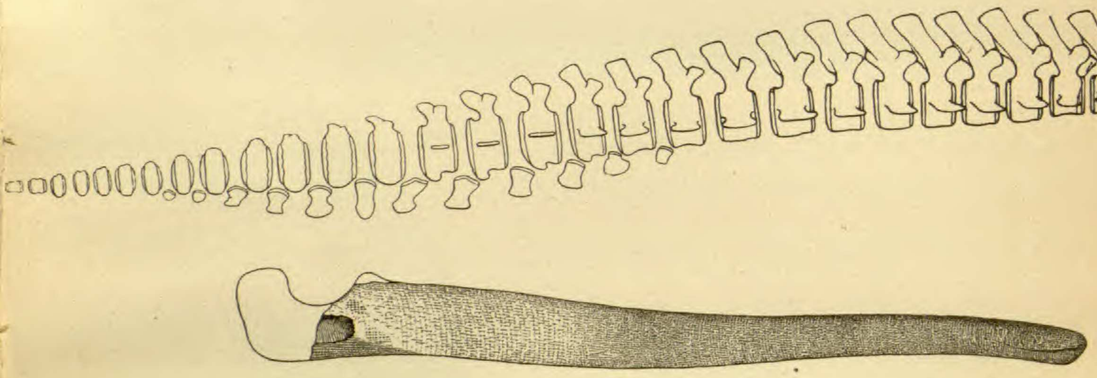
whales have become extinct, some of them in comparatively modern times. Such is the *Cetotherium robustum* Lilljeborg, which is known from a few fragments, not fully fossilized, from an island in the Baltic, and from Cornwall, England.

LIST OF THE EXTINCT CETACEA OF NORTH AMERICA.

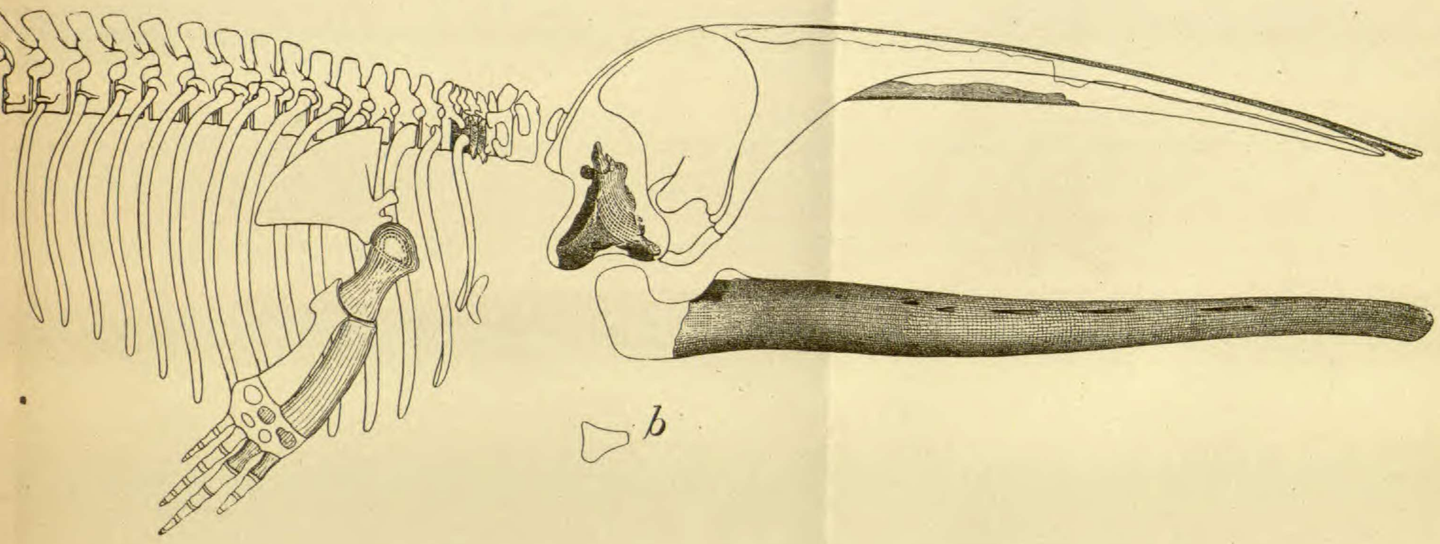
BASILOSAURIDÆ, ... 3

Basilosaurus cetoides Owen. Ala., Miss.
Doryodon serratus Gibbes. Ala., Fla.

PLATE XXII.



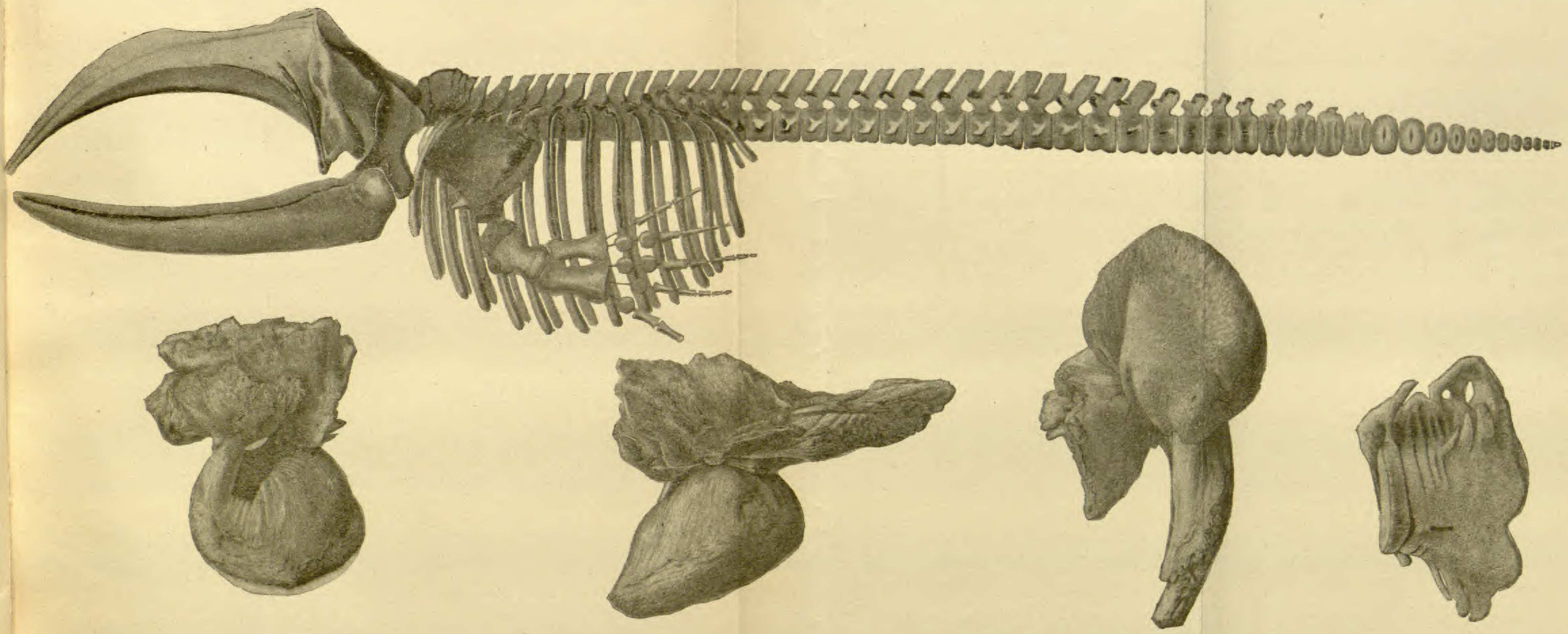
a



b

Cetotherium cephalus Cope.

PLATE XXIII.



Balæna cisarctica Cope.

SQUALODONTIDÆ, ... 6

Squalodon atlanticus Leidy. N. J., Md.
" *vinearius* Leidy. Mass. (Martha's Vineyard.)
" *holmesii* Leidy. S. C.
" *pelagius* Leidy. S. C.
" *pygæmus* Müller. S. C.
" *protervus* Cope. S. C.

PLATANISTIDÆ. 19

Delphinodon mento Cope. S. C.
" *wymanii* Leidy. S. C.
" *venustus* Leidy. S. C.
Lophocetus calvertensis Harlan. Md.
Priscodelphinus grandævus Leidy (=*P. harlani* Leidy). N.J.
" *lacertosus* Cope. Md.
" *gabbii* Cope. Md.
" *uræus* Cope. N. J.
" *ruschenbergerii* Cope. Md.
Zarhachis flagellator Cope. Md.
" *tysonii* Cope. Md.
" *velox* Cope. N. J.
Ixacanthus cœlospondylus Cope. Md.
" *spinosus* Cope. Md.
" *atropius* Cope. Md.
" *conradi* Leidy. Va., Md.
" *stenus* Cope. Md.
Rhabdosteus latiradix Cope. Md.
Agabelus porcatus Cope. N. J.

INCERTÆ SEDIS. 2

Cetophis heteroclitus Cope. Md.
Saurocetus gibbsii Agass. S. C.

PHYSETERIDÆ. 10

Physeter vetus Leidy. N. C.
" *cornutidens* Leidy. N. C., Md.
" *quadratidens* Leidy. N. C.
Hoplocetus obesus Leidy. S. C.
Choneziphius trachops Leidy. S. C.

Choneziphius liops Leidy. S. C.
" *cœlops* Leidy. S. C.
" *macrops* Leidy. S. C.
" *chonops* Leidy. S. C.
Mesoplodon prorops Leidy. S. C.

DELPHINIDÆ. 2

Delphinapterus vermontanus Thompson. Vt., Canada.
" *orcinus* Cope. N. C.
Dephinus occiduus Leidy. Cal.

BALÆNIDÆ, ... 10

Cetotherium pusillum Cope. Md.
" *expansum* Cope. Md.
" *priscum* Leidy. Va.
" *polyporum* Cope. N. C.
" *mysticetoides* Emmons. N. C.
" *cephalus* Cope. Md.
" *leptocentrum* Cope. Va.
Balænoptera palæatlantica Leidy. Va.
" *davidsonii* Cope. Cal.
Mesoteras kerrianus Cope. N. C. —
Total number of species, ... 52

EXPLANATION OF PLATES.

PLATE XX,—*Choneziphius semijunctus* Cope. One-tenth natural size. From photographs of the type in the Museum of Charleston, S. C., taken by Lieut. Vogdes, U. S. A. Fig. 1. Cranium from above; 2, cranium from below; 3, extremity of the mandible, with teeth.

PLATE XXI.—*Delphinapterus leucas* Pallas. One-thirteenth natural size. From a skeleton in the Museum of the Academy of Natural Sciences of Philadelphia, obtained by Dr. I. I. Hayes, from Baffin's Bay. Type of *Beluga concreta* Cope.

PLATE XXII.—*Cetotherium cephalus* Cope. Restoration, one-eighteenth natural size; the portions shaded are the actual specimens of one individual found in the Miocene of Maryland, and now in the Museum of the Academy of Natural Sciences of Philadelphia. Described by E. D. Cope in its Proceedings, 1867, p. 148.

PLATE XXIII.—*Balæna cisarctica* Cope. Type specimen as mounted in the Museum of the Academy of Natural Sciences of Philadelphia; one-thirty-seventh natural size. Fig. 1, side view; Figs. 2, 3, 4, periotic bones from side, end, and below; Fig. 5, cervical vertebræ, oblique inferior view.